

LVSR SPECIFICATIONS DOCUMENT



OCTOBER 2001

LVSr Technology Demonstrator

Major Features -

- Multi-Module Straight Frame Truck (Built on Current LVS Frame)
- 600 Hp, In-Line, 6-Cylinder Engine
- Automatic Transmission, 6 Speed
- Independent Suspension, "All Steer" Steering Axles #1, #2, #4, #5, 16 ½" Wheel Travel
- Interoperability with Raydan, Hendrickson – Mod Tech Rigid Axle Vehicle, and Existing LVS Rear Module
- 10 x 10 Vehicle Configuration
- Rapid Action Central Tire Inflation System
- 16R20 Tires
- Anti-Lock Braking System
- Advanced Traction Control, Advanced Braking Control
- Collision Warning System
- Integrated Electronic Vehicle Network (J1939)
- Dual Voltage Alternator, 14/28 V
- High Efficiency Coolant System
- High Volume Air Compressor
- Hydrostatic Retarder
- Integrated Hydraulic Supply/Transmission
- Extreme Service Brake Compound
- Single Lubricant/Operating Fluid, Single Fill Point
- Elimination of Articulation Joint
- FMVSS Compliant Headlights
- Improved Frontal Impact Crash Protection
- 5-Point Safety Harnesses, Bucket Seats
- Improved Tie-Down Provisions
- Larger Cab, Improved Ergonomics
- 80 Hour Air Cleaner Capability
- Insulated Muffler
- Standard Frame Width
- Transfer Case Eliminated
- Large Capacity Air Dryer
- Lubed-For-Life Prop-Shaft
- Improved Crew Storage Provisions, Mirrors, Cab Step, and Interior Lighting
- Rapid Warm-Up Capability
- Permanent Engine Oil Filtration
- Flat Panel Instrument, Diagnostic and GPS Map Displays
- On-Board Electronic Manual
- Night Driving System
- Emergency Steering
- Electronic Hydraulic Filter Monitoring
- Multi-Purpose Main Hydraulic Pump
 - Fan Drive
 - Auxiliary Hydraulics
 - Retarder
 - Oil Heater
- Multi-Compartment Hydraulic Reservoir
- Reduced Cold Weather Cranking Torque Provisions
- Quick Detachable Hydraulic Connections
- Hydraulic Intensifier in RBU Eliminated
- 600+ Hp Retardation Capability
- 184 Hp Integral Hydraulic Supply

- ***ABS/ATC Collision Warning System*** – Eaton
- ***Advanced Electronic Vehicle Controls*** – NATC/Twin Disc Incorporated
- ***Advanced Synthetic Lubricant Options*** – ADI and ExxonMobile Oil
- ***Air Cleaner*** – Donaldson Company Inc.
- ***Air Compressor*** – Honeywell/Bendix Truck Brake Systems Company
- ***Air Dryer*** – Meritor Wabco
- ***Alternator*** – C.E. Niehoff and Company
- ***Axle Carriers*** – Meritor Automotive Inc.
- ***Cold Start, Capacitive Starting System (No Battery System)*** - Kold Ban International (KBI)/NATC
- ***Cooling System Development*** – G&O Manufacturing Company
- ***CTIS*** – Syegon-Giat Industries
- ***CTIS Selector Panel*** – Phytex/Newest/NATC
- ***Differentials*** – Meritor Automotive Incorporated
- ***Drive Shafts*** – Dana Spicer Corporation
- ***Driver Navigation and Wireless Communications Computer*** – DriverTech, Incorporated
- ***Driving Lights and Headlights*** – Hella North America Inc.
- ***Electrical Load Control and Drain Protection Power Slave*** - NATC
- ***Emergency Steering*** – Twin Disc/Hydradyne
- ***Engine*** – Detroit Diesel Corporation
- ***Fan*** – Engineered Cooling Systems
- ***Flat Panel Display*** – Newest Computers Incorporated/NATC
- ***Fuel Water Separator*** – Detroit Diesel Corporation
- ***Hydraulic Quick Coupling*** – Faster Incorporated
- ***Integral Ballistic Improvements*** – O'Gara-Hess & Eisenhardt (OHE)
- ***Integrated Hydraulic System*** – Twin Disc/Hydradyne/ Island City/NATC
- ***J1939 Vehicle Integration*** - NATC
- ***J1939/PC104 Adapter and J1939 Bridge*** – Dearborn Group, Incorporated/NATC
- ***J1939 Slave Logic Controller*** – NATC
- ***Light Control Panel*** – Phytex America/Newest/NATC
- ***Anti-Mine Runflat at #1 Axle – Beadlocks at #2, #3, #4, #5 Axles*** – Hutchinson Industries Incorporated
- ***Muffler*** – Donaldson Company Incorporated
- ***Permanent Oil Filtration*** – Nelson Industries Incorporated
- ***Principle Hydraulic Pumps*** – Denison Hydraulics
- ***Radiator Shroud*** - Lignitech
- ***Retarder*** – Hydradyne/Island City/Twin Disc
- ***Sealed Axle Lubricant Development*** – Oshkosh/Meritor/Texaco
- ***Seats*** – Beard Seat Company
- ***Silicone Hoses and Connectors*** – Flexfab Corporation
- ***Starter*** – Delco Remy Corporation
- ***Multi-Axle Steering, Suspension, Suspension Installation, Final Drive*** – Oshkosh Truck Corporation
- ***Tires*** – 16R20 – Goodyear Tire Company
- ***Transmission*** – Twin Disc Incorporated
- ***Transmission Selector Panel*** – Phytex/Newest/NATC
- ***Virtual Prototyping (ADAMS)*** – Mechanical Dynamics Incorporated
- ***Wheels*** - Titan Wheel Corporation

LVSr Technology Demonstrator Evaluation Plan -

The LVSr program is a United States Marine Corps project contracted with NATC to improve the safety and performance of the LVS fleet and to address both immediate and future fleet deficiencies/requirements.

NATC has fielded several technology demonstrators: LVS-Mod Demo (Modification Demonstrator), a limited technology insertion effort focused on immediate technical impact; and the ***LVSr-Tech Demo (Technology Demonstrator)***, a future fleet replacement vehicle. Immediate performance enhancements were accomplished with an LVS-Brake Modification vehicle.

The LVS-Mod Demo approach focused on technology that can be added to the core LVS vehicle to demonstrate key technology areas and which could be produced using available USMC vehicle rebuilding capability to provide immediate fleet improvements. The LVS-Mod Demo vehicles were designed and built quickly to address the current fleet operational issues.

The LVSr-Tech Demo was designed and built as a replacement to the current vehicle for the operational term of 2006 to 2026. The Tech Demo LVSr is a prototype and includes all available technologies, and is driving future USMC technology.

The LVSr-Tech Demo was converted to a straight frame (no articulation) truck with integral multi-axle steering. The system accommodates multiple rear body units (RBU). It has a full electronic integration of all systems to optimize the truck for the user and mission. An additional axle was added to the rear body unit to address the allowable bridge law loading and to allow for increased braking.

NATC is testing four different RBUs with the LVSr-Tech Demo vehicle.

- Oshkosh Independent Suspension at the #3, #4 and #5 axles
- Raydan Air-Link Tandem Axle Suspension at the #4 and #5 axles and a modified Hendrickson HT Trailing Arm Suspension at the #3 axle
- Hendrickson HHP (Heplex Hydro-Pneumatic) suspension at the #3, #4 and #5 axles
- Standard Three-Spring Suspension that is currently on the LVS vehicles, known as the Baseline LVS

Red = Tech Demo Vehicle

LVSR SPECIFICATIONS DOCUMENT



This LVSR Specification Document is a Draft Which Will Be Refined by Test and Performance Data. This Document is Provided as an Initial Overview of Each Team Member's Contribution to the LVSR Program.

OCTOBER 2001

LVSR TECHNOLOGY DEMONSTRATOR AIR COMPRESSOR



LVSR Downselected Team Member

Honeywell/Allied Signal/ Bendix Truck Brake Systems
901 Cleveland Street
Elyria, Ohio 44035

POC: Dave Hammes PH: 440-329-9212 FAX: 440-329-9607
Email: Dave.Hammes@Honeywell.com

Air Compressor Specifications:

Manufacturer:	Allied Signal/Bendix/ Honeywell Truck Brake Systems
Model:	Bendix CT596
Type:	Duraflow 2 Cylinder
Capacity (cfm):	21.4 @ 1800 rpm and 120 psi
Operation:	Water Cooled, Naturally Aspirated

Advantages to LVSR Program:

- High Output for Convoy to Battlefield Conditions
 - Smaller
 - Lighter
 - More Efficient
 - Simple Retrofit

Replaces Earlier 4 Cylinder Designs

Acknowledgements:

NATC/Island City would like to recognize the efforts of the Military Support Team at Allied Signal/Bendix/Honeywell Truck Brake Systems Company in Elyria, Ohio.

LVSR TECHNOLOGY DEMONSTRATOR SEATS



LVSR Downselected Team Member

Beard Seat Company

12322 Penn Street

Whittier, California 90602

POC: Tim Sousamian PH: 562-696-6686

Email: info@beardseats.com

Seat Specifications:

Manufacturer:

Beard Seat Company

Advantages to LVSR Program

Integrated 5 point safety harness

Higher bolster supports, similar to racing seats to better support the driver

Lumbar support

Rear tilt adjustment

Front adjustment

Height adjustment

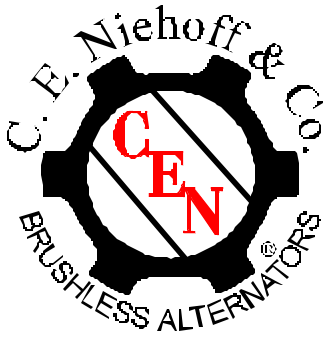
No suspension

Meets USMC durability requirement (wash out procedures for decontamination and normal washing)

Off-highway capability

Low cost

LVSR TECHNOLOGY DEMONSTRATOR ALTERNATOR



LVSR Downselected Team Member
C.E. Niehoff and Company
2021 Lee Street
Evanston, Illinois 60202

POC: Sampson Chriscoe PH: 847-866-1593 FAX: 847-492-1242
Email: schriscoe@ceniehoff.com

Alternator Specifications:

Manufacturer:	C.E. Niehoff and Company
Type:	Brushless 6 phase air cooled
Output:	200 Amps
Voltage:	Dual Voltage 14/28 VDC

As Equipped in LVSR:

- Brushless 6 Phase External Energized and Self Rectifying
- Transient Voltage in Accordance with MIL-STD 1275A
- Radio Noise Suppression per MIL-STD 461D; RE0102, RS103 and CS114
- Overvoltage Protection to Voltage Greater than $33\pm$ Volts
- Shock 100g test in Accordance with MIL-STD 202, Method 213, Condition 1
- Vibration 20g in Accordance with MIL-STD 202, Method 204, Condition D
- External Solid State Regulator with Negative Temperature Compensation
- Weight 63 lbs.

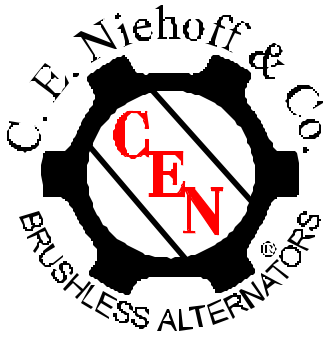
Advantages to LVSR Program:

- Brushless Design No Slip Ring or Brushes to Wear Out
- High Efficiency 60 - 80 % Over Normal Operating Range
- Improved Reliability
- Sealed Bearings
- Salt Spray Corrosion Tested

Acknowledgments:

NATC/Island City would like to recognize the efforts of Sam Chriscoe and the personnel from C.E. Niehoff and Company in Evanston, Illinois.

LVSR TECHNOLOGY DEMONSTRATOR ALTERNATOR



LVSR Downselected Team Member
C.E. Niehoff and Company
2021 Lee Street
Evanston, Illinois 60202

POC: Sampson Chriscoe PH: 847-866-1593 FAX: 847-492-1242
Email: schriscoe@ceniehoff.com

Alternator Specifications:

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As Equipped in LVSR:

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- Radio Noise Suppression per MIL-STD 461D; RE0102, RS103 and CS114
- Overvoltage Protection to Voltage Greater than $33\pm$ Volts
- Shock 100g test in Accordance with MIL-STD 202, Method 213, Condition 1
- Vibration 20g in Accordance with MIL-STD 202, Method 204, Condition D
- External Solid State Regulator with Negative Temperature Compensation
- Weight 63 lbs.

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- Brushless Design No Slip Ring or Brushes to Wear Out
- High Efficiency 60 - 80 % Over Normal Operating Range
- Improved Reliability
- Sealed Bearings
- Salt Spray Corrosion Tested

Acknowledgments:

NATC/Island City would like to recognize the efforts of Sam Chriscoe and the personnel from C.E. Niehoff and Company in Evanston, Illinois.

LVSR TECHNOLOGY DEMONSTRATOR

J1939/PC104



LVSR Downselected Team Member

Dearborn Group, Inc.	Dearborn Group, Inc.	Dearborn Group, Inc.
Main Office, Automotive	Truck & Bus Design Center	W. Regional Sales
27007 Hills Tech Court	2415 Directors Row	P.O. Box 997
Farmington Hills, MI	Indianapolis, IN	Elizabeth, Colorado
48331	46241	80107-0997

POC: Marvin Speer PH: 303-646-1033 FAX: 303-646-1053

Email: marvins@dgtech.com

J1939 Architecture:

Manufacturer:	Dearborn Group, Inc.
Type:	PC104
Network Support:	J1939, CAN, J1708, GM UART, ALDL, J1850
Size:	Standard (3.555" x 3.755")
Weight:	3 oz
Operating Temperature:	-40° to +85° F
Storage Temperature:	-65° to +150° F
Input Voltage:	5 V at 250ma
OS Compatibility:	DOS, Windows 95, 98 and NT
Software Library:	C and C+
TMC Support:	RP1210A & Dearborn Group DLLs
Physical Layer Support:	J1939/11, J1939/12, ISO 11898, J1708, GM UART, ALDL and J1850
Timer Support with DG DLLs:	Timestamp Incoming Messages Set Timed Interrupts to the PC Determine Message Transmission Time

LVSr TECHNOLOGY DEMONSTRATOR

J1939/PC104 (CONTINUED)

As Equipped in LVSr:

- Vehicle Subnet
- Powertrain Subnet
- Diagnostic Subnet
- Instrument Subnet
- Vehicle Operations Controller
- Left and Right Driver Displays
- Bridge to Rear Body Unit

Advantages to LVSr Program:

- Monitoring of Total Vehicle Subsystems Status
- Allows Implementation of CAN 2.0B/SAE J1939 Protocol Diagnostic s
- State-of-the-Art COTS Components
- Bridge Software Allows Communications Between Different Networks
- Integration of Subnets Monitor and Diagnostic Functions
- Enhanced PC104 Diagnostic Interface
- Future Network Monitor and Diagnostic Expansion Compatibility
- Compatibility with Current Operating Systems
- Integral to Electronic Systems Inter-Performance
- Follow-On Technical Development Adaptability
- Bridging of Rear Body Unit Monitor and Diagnostics Functions
- Real-Time Message Data Reporting for Mission Optimization

Acknowledgements:

NATC/Island City would like to recognize the efforts of Marvin Speer, Bob McClure, Dave Such, and George Tungate.

LVSr TECHNOLOGY DEMONSTRATOR

PRINCIPLE HYDRAULIC PUMPS



LVSr Downselected Team Member

Denison Hydraulics, Inc.
14249 Industrial Parkway
Marysville, Ohio 43040

POC: James Walker PH: 937-644-4580 FAX: 937-642-3738
Email: jwalker@denisonhydraulics.com

Steering Pump Specifications:

Manufacturer:	Denison Hydraulics, Inc.
Type:	Variable Volume, Axial Position, Rapid Response
Size:	3.78 in ³ /Rev
Model:	PVT 29
Capacity:	29 GPM @ 1800 RPM
Compatibility:	Petroleum Base Fluid or Equivalent

Fan, Retarder and Auxiliary Pump Specifications:

Manufacturer:	Denison Hydraulics, Inc.
Type:	Variable Volume, Axial Position, High Pressure
Size:	4.8 in ³ /Rev
Model:	Premier PO5
Capacity:	37.4 GPM @ 1800 RPM, 7250 PSI Max
Compatibility:	Petroleum Base Fluid or Equivalent

LVSr TECHNOLOGY DEMONSTRATOR

PRINCIPLE HYDRAULIC PUMPS (CONTINUED)

As Equipped in LVSr:

Steering Pump

- Load Sense Control
- Rapid Response
- Through Drive
- Compatible with Single Lubricant Fluid Concept

Fan, Retarder and Auxiliary Pump

- Rapid Response
- Through Drive
- Compatible with Single Lubricant Fluid Concept
- High Power Retard

Advantages to LVSr Program:

Steering Pump

- HP Used Only When Required by Steering
- Quick Response to Steering Demand
- Allows For Minimum Number of Pump Drives
- Supports Single Lubricant Concept
- Supports Single Fluid Reservoir

Fan, Retarder and Auxiliary Pump

- Minimal Losses Operating Fan
- Quick Response for Retard
- Allows For Minimum Number of Pump Drives
- Supports Single Lubricant Concept
- Supports Single Fluid Reservoir

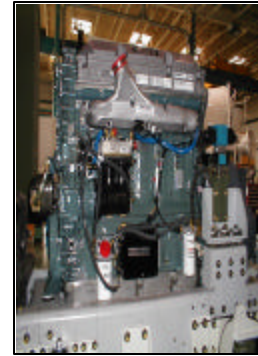
Acknowledgements:

NATC/Island City would like to recognize the efforts of James Walker and the personnel from Denison Hydraulics in Marysville, Ohio.

LVSR TECHNOLOGY DEMONSTRATOR ENGINE

DETROIT DIESEL

CORPORATION



LVSR Downselected Team Member
Detroit Diesel Corporation
13400 Outer Drive, West
Detroit, Michigan 48239-4001

POC: David Brunette PH: 313-592-7291 FAX: 313-592-5906
Email: david.brunette@detroitdiesel.com
Walter Ward PH: 313-592-7677 FAX: 313-592-5158
Email: walter.ward@detroitdiesel.com

Engine Specifications:

Manufacturer:	Detroit Diesel Corporation
Model:	6063-HK33
Type:	Series 60, 4 Stroke Compression Ignition
Electronic Controls:	DDEC IV Direct Injection
Engine Curves Available:	4
Cooling:	Water
Lubrication System:	Natural and Synthetic Oils
Total Engine Oil Capacity with Filters:	38 qt.
Oil Filter, Two Full Flow	30 microns
Cylinders:	In-Line 6
Bore:	5.24"
Stroke:	6.11"
Displacement:	855 in ³ (14.0L)
Compression Ratio:	15.0:1
Maximum Torque:	1965 lb.ft. @ 1200 - 1500 rpm
Power Output:	600 Hp @ 2300 rpm
Weight:	2802 lb.
EPA Certification:	1999 U.S. and California Non-Road

LVSR TECHNOLOGY DEMONSTRATOR ENGINE (CONTINUED)

As Equipped in LVSR:

- Jacobs Brake - 518 HP @ 2300 RPM
- Allied Signal/Bendix 30 cfm Large-Volume Compressor
- G&O Manufacturing Air-to-Air Charge Cooler
- C.E. Niehoff 14/28 V Alternator, 200A, Self-Adjusting Poly-V Drive
- Delco Remy Starter
- KBI Ether Injection System- Integral
- “Ecoclean” Nelson Reusable Oil Filters
- Fuel Water Separator with Integral Manual Priming Pump

Advantages to LVSR Program:

- High Horsepower to Weight Ratio
- Demonstrated Ability on 60% Longitudinal Slope
- Demonstrated Ability on 30% Side Slope
- J1939 Compatible/4 Engine Curves
- Self Diagnostic
- Full 1965 lb.ft. Torque Available with Twin Disc Transmission
- JP-8 Full Performance
- Integrated with Single Oil Lubrication System
- Combat Override Mode and Limp-Home Capability

Acknowledgments:

NATC/Island City would like to recognize the efforts of David Brunette, Walter Ward, Ron Berry and the personnel from Inland Diesel in Milwaukee, Wisconsin.

LVSR TECHNOLOGY DEMONSTRATOR

AIR CLEANER, MUFFLER



LVSR Downselected Team Member
Donaldson Company, Incorporated
1400 West 94th Street
Minneapolis, Minnesota 55440



POC: John Schulte PH: 612-887-3264 FAX: 612-887-3221
Email: jschulte@mail.donaldson.com

Air Cleaner Specifications:

Manufacturer:	Donaldson Company, Inc.
Type:	Military Heavy Duty Two Stage
Size:	46 X 36 X 13
Model:	SFD24-0018
Restriction:	9.00" H2O Maximum
Compatibility:	1570 CFM
MIL STD:	MIL-PRF-62048

Muffler Specifications:

Manufacturer:	Donaldson Company, Inc.
Type:	Heavy Duty Fully Insulated Ejector Muffler
Model:	WJM13-0069
Size:	11 X 16 Oval x 39" Overall Length
Restriction:	3.00" Hg Maximum
Compatibility:	3520 CFM @ 975F
MIL STD:	Commercial Industry Standards

LVSR TECHNOLOGY DEMONSTRATOR

AIR CLEANER, MUFFLER (CONTINUED)

As Equipped in LVSR (Air Cleaner):

- New EON® Filter Media
- Strata® Tube PreCleaner
- High Capacity V-Pac® Filter
- Aluminized Steel Material
- Exhaust Scavenge System
- Hand Operated Latches

As Equipped in LVSR (Muffler):

Exhaust Ejector System
Fully Insulated
Aluminized Steel Material
Integral Mounting Brackets
Rain Cap

Advantages to LVSR Program (Air Cleaner):

- Long Life/E-Z to Clean Filter
- Media
- High Efficiency Dust Separation
- Corrosion Resistant Materials
- No Maintenance Dust Removal System
- No Tool Servicing

Advantages to LVSR Program (Muffler):

No Maintenance Dust Removal

Increased Noise Attenuation
Low Skin Temperature (Safety)
Corrosion Resistant Materials

Weather Protection

Acknowledgements:

NATC/Island City would like to recognize the efforts of John Schulte and the personnel from Donaldson Company, Inc. in Minneapolis, Minnesota.

LVSR TECHNOLOGY DEMONSTRATOR

DRIVER NAVIGATION COMPUTER



LVSR Downselected Team Member
DriverTech, Incorporated
2212 South West Temple, Suite 48
Salt Lake City, Utah 84115

POC: Mark Haslam PH: 801-468-0999 FAX: 801-487-2775
Email: mark@qsicorp.com

Computer Specifications:

Manufacturer:	DriverTech, Incorporated
Type:	DT-800m TruckPC
Detail:	MIPS 130MHz, 5 Serial Ports, 1 Parallel Port, 2 PCMCIA Slots, External Keyboard and Mouse Ports, Speaker and Microphone Jacks.
Display:	640 by 480 High Brightness, Active Matrix Color TFT.
Keypad:	24 Stainless Steel Snap Dome Keys Placed Peripherally Around the Display. Keys are Backlighted.
Compatibility:	Microsoft Windows CE Operating System
Operating Temperature:	14° to 140° F
Storage Temperature:	-40° to 185° F
Environmental:	SAE J1455 Compliant (Truck and Bus Specification)
Software Applications:	Commercial and Military Map Navigation. Commercial Satellite Communication, SAE J1708/J1939 Diagnostic Interface.

LVSR TECHNOLOGY DEMONSTRATOR DRIVER NAVIGATION COMPUTER (CONTINUED)

As Equipped in LVSR:

- 48 Meg of Flash Memory, 32 Meg DRAM
- Active Matrix VGA Display, High Brightness
- Conformally Coated Circuit Boards
- Internal Shielding
- Satellite Communication System
- Commercial GPS
- PLGR Interface Capable
- NIMA CADRG Maps of Washington/Baltimore Area
- E-mail Program
- Dispatch Program
- SAE J1708/J1939 Interface and Monitor Program

Advantages to LVSR Program:

- Easy to Operate, Even with Little or No Computer Experience
- Keys are Easy to Press, Even with MOPP Gloves
- Map Navigation Program Provides Driver with Digitized NIMA Charts
- Communication Program Includes Remote Machine Commands
- Map Over-Layer for Placing Icons onto the NIMA Chart Remotely
- DT-800m can be Adjusted for View with One Large Wing Nut
- Small Footprint Saves Space in the Cab, and Allows Flexibility in Placement
- Satellite Transceiver Provides the Marine with Link to Command Center
- J1939 Interface Allows Command Center to Monitor Truck Performance

Acknowledgements:

NATC/Island City would like to recognize the efforts of Mark Haslam and the personnel from DriverTech, Incorporated in Salt Lake City, Utah.

LVSR TECHNOLOGY DEMONSTRATOR



LVSR Downselected Team Member

**Eaton Corporation
13100 E. Michigan Avenue
Galesburg, Michigan 49053-9674**

**POC: Maurice M. Pickens PH: 616-342-3171 FAX: 616-342-3627
Email: mauricempickens@eaton.com**



LVSR Downselected Team Member

**Dana Spicer Corporation
P.O. Box 955
Toledo, Ohio 43697-0955**

POC: Bruce Russen PH: 419-866-2633 FAX: 419-866-2616

Specification data not developed to date, however, NATC/Island City would like to recognize the efforts of Maurice Pickens of Eaton Corporation and Bruce Russen of Dana Spicer Corporation.

LVSR TECHNOLOGY DEMONSTRATOR FAN



LVSR Downselected Team Member
Engineered Cooling Systems
201 W. Carmel Drive
Carmel, Indiana 46032

POC: Mike Noe - Sales PH: 317-846-3438 x222 FAX: 317-846-3460

Email: noe@ecsfans.com

George Snodgrass - Engineering PH: 317-846-3438 x235 FAX: 317-846-3460

Email: snodgrass@ecsfans.com

Fan Specifications:

Manufacturer:	Engineered Cooling Systems
Type:	Axial Flow Fan
Size:	42 in Diameter
Number of Blades:	8
Weight:	35.8 lbs.
Inertia:	10.22 lb-in-sec ²
Pitch Width:	3.32 in
Operating Temperature:	120° F

LVSR TECHNOLOGY DEMONSTRATOR

FAN (CONTINUED)

As Equipped in LVSR:

- Clockwise Rotation Puller
- Equipped With Hub for 1 Inch Tapered Shaft With .25 Inch Keyway
- Aluminum Blades
- Double Spider Construction

Advantages to LVSR Program:

- Low Fan Noise
- Low HP Draw
- Increased Efficiency

Acknowledgements:

NATC/Island City would like to recognize the efforts of Mike Noe, George Snodgrass and the personnel from ECS in Carmel, Indiana.

LVSr TECHNOLOGY DEMONSTRATOR

HYDRAULIC QUICK COUPLING



LVSr Downselected Team Member

Faster Incorporated

3615 Briarfield Blvd., Fleet A

Maumee, Ohio 43537

POC: Doug Steed PH: 419-868-8197 FAX: 888-316-2695

Email: dsteed@fasterinc.com

Barry Martens PH: 419-868-8197 FAX: 888-316-2695

Email: bmartens@fasterinc.com

Hydraulic Quick Coupling Specifications:

Manufacturer:	Faster, Inc.
Model:	2P510-3-B
Type:	Multifaster 4-Port
Size:	2 3/4" and 1 1/2" Couplers
Rated Capacity:	3/4" Couplers - 35 GPM @ 3650 PSI 1/2" Couplers - 15 GPM @ 3650 PSI
Seals:	Polyurethane

LVSR TECHNOLOGY DEMONSTRATOR

HYDRAULIC QUICK COUPLING (CONTINUED)

As Equipped in LVSR:

- 4-Port 2 3/4" Couplers & 1 1/2" Couplers
- Flat-Face No Spill Couplers
- SAE O-ring Connections
- Locking Device
- Integral Dust Cap

Advantages to LVSR Program:

- Connectable Under Pressure
- Non-Reversible Connection
- No Spill Disconnection
- Cannot Be Accidentally Disengaged

Acknowledgements:

NATC/Island City would like to recognize the efforts of Doug Steed, Barry Martens and the personnel from Faster, Inc. in Maumee, Ohio.

LVSR TECHNOLOGY DEMONSTRATOR

SILICONE HOSES AND CONNECTORS



LVSR Downselected Team Member

Flexfab div. of FHI Inc.

1699 West M-43 Highway

Hastings, MI 49058-9285

POC: Rhonda Struble, Sales PH: 414-554-5050 FAX: 414-554-2321

Email: RhondaS@wi.flexfab.com

Rod Ward, Sales Engineering PH: 616-945-2433 FAX: 616-945-4804

Email: rward@flexfab.com

Coolant Hose Specifications:

Manufacturer:

Type:

Sizes:

Compatibility:

MIL STD:

COMMERCIAL STD:

Flexfab div. of FHI Inc.

Polyester Reinforced,

Silicone Rubber,

Coolant Hose

3/4" - 2-3/4"

Ethylene Glycol, Propylene

Glycol & Long Life

Coolants

A-A-52426 & ZZ-H-428

SAE J20 R1 & R3 Class A

Charge Air Connector Specifications:

Manufacturer:

Type:

Size:

Flexfab div of FHI Inc.

4 ply Nomex Reinforced

Silicone Rubber Bellows

4" ID X 6" Long

LVSr TECHNOLOGY DEMONSTRATOR

SILICONE HOSES AND CONNECTORS (CONTINUED)

As Equipped in LVSr:

Silicone Coolant Hose:

- Radiator Hoses, Vent Hoses, Overflow Hoses, Heater Hoses

Silicone Charge Air Connector Bellows:

- Hot Side: Turbo to Intercooler
- Cold Side: Intercooler to Intake Manifold

Advantages to LVSr Program:

Silicone/Polyester Coolant Hose:

- -54C (-65° F) to +177C (+350°F) Operating Temperature
- Ozone, Oil & Fuel Resistant
- Warrantee for 1 Million Miles or 10 Years
- 20 Year Storage Life per MIL-HDBK-695
- Operating Pressure: 30 psi.
- Burst Pressure: 350 psi.

Silicone/Nomex Charge Air Connector Bellows:

- -54C (-65° F) to +260C (+500° F) Operating Temperature
- Ozone, Oil & Fuel Resistant
- 20 Year Storage Life per MIL-HDBK-695
- Operating Pressure: 50 psi.
- Burst Pressure: 300 psi.

Acknowledgements:

NATC/Island City would like to recognize the efforts of Rhonda Strubel, Rod Ward and the personnel from Flexfab div. of FHI in Hastings, Michigan.

LVSR TECHNOLOGY DEMONSTRATOR

RADIATOR/CHARGE AIR COOLER ASSEMBLY



LVSR Downselected Team Member

G&O Manufacturing Company
100 Gando Drive
New Haven, Connecticut 06513

POC: Mark Zembrzusi PH: 203-562-5121 FAX: 203-789-8760
Email: mzembrzu@transpro.com

Radiator Specifications:

Manufacturer:	G&O Manufacturing Company
Make:	ULTRA FUSED®
Design Construction:	Bolted Steel Tank
Model:	X-6554-00 (Ref Assembly X-6554-00-50)
Core Type:	Copper/Brass Serpentine Louvered Fins, Welded Tubes
Size:	2240 Square Inches
Coolant Capacity:	53 Quarts
Ambient Operating Temperature:	120° F

Charge Air Cooler Specifications:

Manufacturer:	G&O Manufacturing Company
Make:	ULTRA SEAL™
Model:	X-67086-00 (Ref Assembly X-6554-00-50)
Type Core:	Aluminum Serpentine Non-Louvered Fins, Welded Tubes
Size:	1140 Square Inches
Manifolds (Air Inlet and Outlet):	Cast Aluminum
Construction:	Controlled Atmospheric Brazed (CAB)

LVSR TECHNOLOGY DEMONSTRATOR

RADIATOR/CHARGE AIR COOLER ASSEMBLY (CONTINUED)

As Equipped in LVSR:

- G&O Radiator with Copper/Brass ULTRA FUSED® Welded Tube To Header Joint Core
- Bolted Radiator Tanks
- G&O Heavy Duty ULTRA SEAL™ Charge Air Cooler
- Integral Surge Tank
- Integral Radiator Fan Shroud

Advantages to LVSR Program:

- Radiator Welded Tube To Header Joints For Long Life of Core
- Bolted Radiator Tanks For Added Durability and Serviceability
- ULTRA SEAL™ Charge Air Cooler Design To Minimize Thermal Fatigue
- Integral Surge Tank Eliminates The Need For a Remote Surge Tank

Acknowledgements:

NATC/Island City would like to recognize the efforts of Dave Thompson, Mark Zembrzuski and the personnel from G&O Manufacturing Company in New Haven, Connecticut.

LVSR TECHNOLOGY DEMONSTRATOR TIRES



LVSR Downselected Team Member
The Goodyear Tire and Rubber Company
P.O. Box 3531
Akron, Ohio 44309-3531

POC: Jim Nespo PH: 330-796-2010 FAX: 330-796-8835
Email: Jim_Nespo@goodyear.com

Tire Specifications:

Manufacturer:	The Goodyear Tire and Rubber Company
Type:	Military OTR Tire
Size:	16.00R20 Tubeless
Load Range:	M
Section Width:	17.1 Inches
Outside Diameter:	52.1 Inches
Static Loaded Radius:	23.7 Inches
Revs/Mile:	403

Initial LVSR Inflation Pressures

Terrain	Speed	Full Payload		Half Payload		Empty	
		Axles #1/2 6,783 lb/Tire	Axles #3-5 11,332 lb/Tire	Axles #1/2 6,762 lb/Tire	Axles #3-5 9,487 lb/Tire	Axles #1/2 6,667 lb/Tire	Axles #3-5 3,910 lb/Tire
Highway	65 MPH	60 psi	110 psi	60 psi	90 psi	60 psi	50 psi
Cross Country	45 MPH	40 psi	60 psi	40 psi	50 psi	40 psi	30 psi
Multi-Terrain	30 MPH	35 psi	50 psi	35 psi	40 psi	35 psi	25 psi
Snow/Ice	25 MPH	30 psi	40 psi	30 psi	35 psi	30 psi	20 psi
Deep Mud	20 MPH	25 psi	35 psi	25 psi	30 psi	25 psi	10 psi
Sand	20 MPH	25 psi	35 psi	25 psi	30 psi	25 psi	10 psi

GCW: 45,300 lbs.
GVW (On-Hwy): 90,300 lbs.
GVW (Off-Hwy): 78,300 lbs.

LVSr TECHNOLOGY DEMONSTRATOR TIRES (CONTINUED)

As Equipped in LVSr:

- Off Road Mobility
- Mud, Sand and Snow Traction
- Aggressive Tread Design
- On/Off Road Ride Comfort to Reduce Driver Fatigue
- On Road Wet and Dry Handling
- Tire Durability
- Standardized Size
- Improved Heavy Tactical Vehicle Logistics
- Commonality with HET, HEMTT, PLS and MTVR

Advantages to LVSr Program:

- Better Ride Comfort
- Improved Mud Traction
- Equivalent Sand Traction
- Comparable Bead and Casing Durability
- Equivalent Wet Stopping Distance
- Increased Tread Life
- Good Tire Air Retention

Inflation Pressure Data:

- Inflation Pressures were Selected to Maximize Off-Road Mobility.
Vehicle Ride Handling Needs to be Evaluated.
- Inflation Pressures Used Were For Maximum Tire Loading Per Axle.

Acknowledgements:

NATC/Island City would like to recognize the efforts of Jim Nespo and the personnel from The Goodyear Tire and Rubber Company in Akron, Ohio.

LVSR TECHNOLOGY DEMONSTRATOR ANTI-MINE RUNFLAT AND BEADLOCKS



LVSR Downselected Team Member
Hutchinson Industries, Incorporated
460 Southard Street
Trenton, New Jersey 08638

POC: Pascal Seradarian PH: 609-394-1010 x5016 FAX: 609-394-2031
Email: psaradarian@hutchinsoninc.com

Anti-Mine Runflat Specifications:

Manufacturer:	Hutchinson Industries Inc.
Model:	16.00R20

Beadlock Specifications:

Manufacturer:	Hutchinson Industries Inc.
Model:	1600 x 20 x 10

As Equipped in LVSR:

- Anti-Mine Runflat in Axle #1
- Beadlocks in Axles #2, #3, #4 and #5

Advantages to LVSR Program:

- Anti-Mine Runflat Protects Driver
- Allows Runflat Capability and #1 Axle Steering Capability
- Protection Up to Medium Anti-Tank Mine
- Beadlocks Allow Optimal Use of Central Tire Inflation System and Prevents Bead Unseating at Reduced Tire Inflation Pressures

Acknowledgements:

NATC/Island City would like to recognize the efforts of Pascal Seradarian and the personnel from Hutchinson Industries, Inc. in Trenton, New Jersey.

LVSr TECHNOLOGY DEMONSTRATOR RETARDER



Hydradyne Hydraulics

Division of LOR Inc.

LVSr Downselected Team Member
Hydradyne Hydraulics Incorporated
1185 Corporate Drive West
Arlington, Texas 76006

POC: Bob Schriewer PH: 817-607-9100 FAX: 817-649-3348
Email: HYDRAARL@aol.com

Retarder Specifications:

Manufacturer:	Hydradyne Hydraulics Inc.
Type:	Variable Volume, Axial Piston, Rapid Response
Size:	4.9 in ³ /Rev
Model:	PO5
Capacity:	189 AP Continuous, 220 AP Intermittent
Compatibility:	Petroleum Based Fluids or Equivalent
Operating Temperature:	Dictated by Type of Fluid Which Sets Minimum Viscosity Level (Hot) and Maximum Viscosity Level (Cold), Typically -50° F to 240 ° F

LVSR TECHNOLOGY DEMONSTRATOR RETARDER (CONTINUED)

As Equipped in LVSR:

- Fully Integrated System, Allowing Infinite Variable Torque Retarding From Signal Received From Can Bus System. System Allows for Single Hydraulic Pump for Fan Drive, Retarder and Auxiliary Hydraulics.

Advantages to LVSR Program:

- High AP Density
- Single Lubrication Fluid with Single Reservoir
- Single Hydraulic Pump for Fan
- Retarding and Auxiliary, Less Weight
- Precise Retarding Control to Maximize Gradeability
- Full Retarding Engine Independent of Engine Speed

Acknowledgements:

NATC/Island City would like to recognize the efforts of Bob Schriewer and the personnel from Hydradyne Hydraulics Inc. in Arlington, Texas.

LVSR TECHNOLOGY DEMONSTRATOR

SINGLE LUBRICANT CONCEPT



LVSR Downselected Team Member

Island City Engineering
New Product Development Center (NPDC)
480 Western Road
Schofield, Wisconsin 54476

POC: Geof Schmitz PH: 715-241-6700 FAX: 715-241-6900

Email: gschmitz@netscape.net

Single Lubricant Concept:

As Equipped in LVSR:

- Single Reservoir and Single Lubricant
- Integrated Hydraulic Supply (Engine, Transmission, Retarder, LHS, Steering, Cooling Fan and Auxiliary Hydraulics are all Operated on Standard Motor Oil Utilizing One Reservoir)
- Three Internal Reservoir Compartments so That the Transmission/Main Hydraulics and Primary and Secondary Steering Systems Have Their Own Dedicated Reservoir Within The Tank
- Synthetic Lubricant (Mobil Delvac 1) Will Allow Operation Between -40° F and 125° F With Single Lubricant
- Improved Fuel Economy

As Equipped in LVSR:

- Only One Reservoir and Lubricant For the Entire Truck (Except Axles)
- Improved Cleanliness
- Fluid Level For Entire Truck Very Easily Checked at One Site Glass
- Oil Overheating Potential is Reduced as Larger Reservoir Offers a Buffer and Requires Longer to Overheat
- Rapid Warm-Up. Consistent and Correct Operating Temperature Achieved Without Regard to Outside Ambient Temperature. All Oil in Vehicle System can be at Optimal Operating Temperature in a Few Minutes as the P-05 Retarder Pump will be Used Initially to Bring all Oil up to Operating Temperature
- Consistent Oil Viscosity Due to Operating at a More Constant Temperature at All Times

LVSR TECHNOLOGY DEMONSTRATOR SINGLE LUBRICANT CONCEPT (CONTINUED)

As Equipped in LVSR (Continued):

- All Oil can be Directed Through a Single Cooler, Thus Multiple Coolers are Not Required
- Longer Oil Life as There is Less Deterioration with Larger Volumes of Oil and Synthetic Oil will Extend Oil Drain Interval
- Utilized Normally Unused Portions of Oil. For Example, Emergency Steering Reservoir is Only Used if Primary System Fails, Thus This Oil May Go Unused For Months. This Oil is Now Used and Part of Overall Available.
- Shared but Compartmented Oil. For Example, if Steering Failures Occurs, You Have Larger Volume to Keep Truck Going Longer. Opportunity to Get the Truck Off Road in an Emergency is Improved.
- Improves the De-aeration of Oil as Oil Flow over Obstructions in Reservoir. Forced Mixing in Reservoir so all Oil is at Normal Temperature.
- Only One Return Filter, Two Filters Eliminated
- Reservoir Sealed. Add Oil to Transmission, Which is Checked Normally While Engine is Running. Oil Goes Through Return Filter Before Contacting Other Hydraulic Components.
- System will Automatically “Top Off” Engine (Initial Fill of Engine Has to be Performed Manually, But Proper Level Maintenance Thereafter.)
- Monitored Differential Pressure Across Filter to Use an Indicator of Need to Change Filter
- Equipped with Nelson Ecoclean Cleanable Filtration System - Extended Filter Change Interval
- Low Temperature Starting Improvement - No Main Hydraulic Pump Load During Crank-Up
- Can be Retrofitted to Existing Vehicle Systems as the Integrated Hydraulic System is Compact (i.e., Directly Applicable to HEMTT and PLS)

Acknowledgements:

NATC would like to recognize the efforts of Geof Schmitz from Island City Engineering, as well as contributing technologies from Bob Schreiwer of Hydradyne Hydraulics in Arlington, Texas, Ed Wilson of Twin Disc in Racine, Wisconsin, Mobile Oil and Chuck Cepak of ADI Technologies in McLean, Virginia.

LVSR TECHNOLOGY DEMONSTRATOR

COLD START SYSTEM



LVSR Downselected Team Member

Kold Ban International (KBI)

8390 Pingree Road

Lake in the Hills, Illinois 60102-8561

POC: Jim Burke, Jr. PH: 847-658-8561 FAX: 847-658-9280

Email: joburke@koldban.com

Dean Solberg PH: 847-658-8561 FAX: 847-658-9280

Email: drsolberg@koldban.com



Cold Start System Specifications:

Manufacturer: Kold Ban International (KBI)

Make: DDEC Ether Start

Model: 23518055

Type: 24 V, 21oz.

Reservoir Capacity: 21 Ounce

Electronic Control Unit: DDEC Ether Injection Relay 23517781

Compatibility: All DDEC III & IV Engines

(Universal kits available for all other engine makes and models)

Operating Temperature: -40°F - +212°F

MIL STD: MIL-E- 52649B

LVSR TECHNOLOGY DEMONSTRATOR

COLD START SYSTEM (CONTINUED)

As Equipped in LVSR:

- Decrease initial cranking time to “First Fire”.
- Eliminate additional cranking cycles on cold soaked engines.
- Lessen engine vibration due to uneven combustion chamber firing by monitoring the entire “Warm-Up” period and providing starting fluid until the engine is running smoothly.
- Help prevent dilution of engine lube oil from un-burnt fuel by reducing the time combustion chambers are not firing.
- Reduce exhaust “White Smoke” by shortening the time combustion chambers are not firing.
- Indicate when the Starting Fluid Cylinder is low by activating a “Low Cylinder” light.
- Totally eliminate operator error or abuse through fully-automatic controls that cannot be overridden.

Advantages to LVSR Program:

- Increase the fleets ready rate.
- Longer cranking motor / system life.
- Fast starts - shorter cranking cycles.
- New generation of ether systems (No Human Interface).
- Cold start white smoke output greatly reduced (Improved Stealthiness).
- Retrofit easily to existing fleets.
- Low maintenance (Replace ether bottle on occasion)
- Existing NSN number for replacement ether bottle.

Acknowledgements:

NATC/Island City would like to recognize the efforts of Jim Burke, Jr., Dean Solberg and the personnel from KBI in Lake in the Hills, Illinois.

LVSR TECHNOLOGY DEMONSTRATOR CAPACITOR



LVSR Downselected Team Member

Kold Ban International (KBI)
8390 Pingree Road
Lake in the Hills, Illinois 60102-8561

POC: Jim Burke, Jr. PH: 847-658-8561 FAX: 847-658-9280
Email: joburke@koldban.com
Dean Solberg PH: 847-658-8561 FAX: 847-658-9280
Email: drsolberg@koldban.com

Capacitor Specifications:

Manufacturer: Kold Ban International (KBI)
Model: 20EC402-120-26/13-0.006
Operating Voltage Window in V: 26-13
Maximum Operating Voltage in V, Not More Than: 29
Ultimate Maximum Voltage in V.*: 32
Ultimate Minimum Voltage in V.*: 4
Total Energy Stored Within Operating Voltage Window in kJ Not Less Than: 120
Capacitance in F, Not Less Than: 500
Maximum Internal Resistance in OHM, Not More Than: 0.006
Maximum Power in kW: 28
Weight in kg: 27
Dimensions (LxWxH) in mm, Not More Than: 330 x 173 x 248
Operating Temperature: -40°F - +122°F

LVSR TECHNOLOGY DEMONSTRATOR

CAPACITOR (CONTINUED)

As Equipped in LVSR:

- Long Service Life
- High Specific Power
- Fast Charge Rate
- Maintenance Free
- Efficient Under Cold Conditions
- Essentially Unlimited Shelf Life

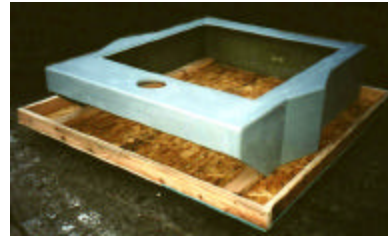
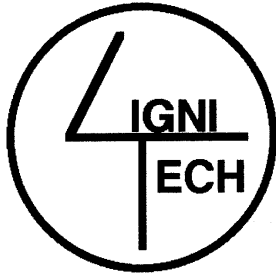
Advantages to LVSR Program:

- Increase the Fleets Ready Rate
- No System Maintenance
- No Disposal Problems
- Safe
- No Shipping Problems
- Better Low Temperature Performance

Acknowledgements:

NATC/Island City would like to recognize the efforts of Jim Burke, Jr., Dean Solberg and the personnel from KBI in Lake in the Hills, Illinois.

LVSR TECHNOLOGY DEMONSTRATOR RADIATOR SHROUD



LVSR Downselected Team Member

Lignitech

P.O. Box 1918

Port Townsend, WA 98368

POC: Todd Uecker PH: 360-379-0115 FAX: 360-379-0115

Email: lignitech@waypoint.com

Shroud Specifications:

Manufacturer:

Lignitech

Resin Used:

Heat-resistant Vinylester

Reinforcement:

Fifteen e-glass laminates of
24 oz. Roving/1.5 oz. Mat

Weight:

75 lbs.

As Equipped in LVSR:

- Resin system used is a modified vinylester, with optimized properties of tensile and flexural strength with a high heat distortion temperature
- Reinforcing fabrics were chosen to match the strength, weight and toughness requirements of the LVSR
- Polyester gelcoat suitable as a base for durable epoxy top-coatings

Advantages to LVSR Program:

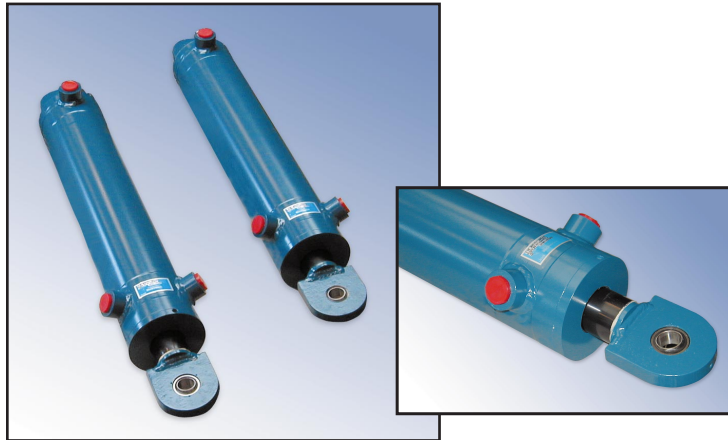
- Tough monocoque structure
- High strength to weight ratio allows for easy removal to access underlying components of vehicle
- Corrosion free, heat and chemical resistant
- Molded composites offer exact reproducibility of complex shapes for mass production

Acknowledgements:

NATC/Island City would like to recognize the efforts of Todd Uecker from Lignitech in Port Townsend, Washington.

LVSR TECHNOLOGY DEMONSTRATOR

Steering – Linear Actuators



LVSR Downselected Team Members

Mannesmann Rexroth Corporation
2315 City Line Road
Bethlehem, PA 18017

POC: Jon Wilcox
PH: 610-694-8327
FAX: 610-694-8266
Email: jwilcox@ihd.rexroth.com

ADI Technologies, Inc.
1487 Chain Bridge Road, Suite 204
McLean, VA 22101

POC: Chuck Cepak – PM
PH: 703-734-9626
FAX: 703-448-8591
E-mail: adit22101@aol.com

Linear Actuator Specifications:

Manufacturer:	Mannesmann Rexroth Corporation
Model:	CY20MP5/88.9/56/508/B1KLUKWAN
Type:	Series C20
Bore:	3.5 inches
Rod:	2.2 inches
Stroke:	20 inches
Mountings:	Single Blade Clevis Mount on Both Sides
Mounting Bearings:	Maintenance Free Spherical Bearings on Both Sides
Piston Rod:	Carbon Steel with Ceramax™ Rod Coating Surface Finish – Ra 0.1–0.3 m (4–12 m inch) Surface Hardness – 900–1000 Hv (67–72 Rc) Layer Thickness > 150 m (> 0.006 inches)
Construction:	Threaded Head, Welded Bottom
Seals:	Piston – Glide Ring Seals with Guiding Strips Piston rod – Ceramax Step Seals
Design Pressure:	3480 psi
Test Pressure:	4640 psi

LVSr TECHNOLOGY DEMONSTRATOR

Steering – Linear Actuators (continued)

Advantages to LVSr Program:

Maintenance Free Spherical Bearings on Both Sides
Superior Corrosion Resistance – withstood 1000 hour salt spray test
Per DIN 50021 ESS/ASTM G 85
Excellent Wear Resistance
High Impact Resistance
Extremely Durable in Corrosive and Abrasive Conditions
Long Service Life
Good Elasticity

Acknowledgements:

NATC/Island City would like to recognize the efforts of Chuck Cepak from ADI Technologies, Inc. in McLean, Virginia and Jon Wilcox from Manesmann Rexroth Corporation in Bethlehem, Pennsylvania.

LVSr TECHNOLOGY DEMONSTRATOR AXLE CARRIERS/DIFFERENTIALS



LVSr Downselected Team Member

Meritor Automotive L. L. C.

2135 West Maple Road

Troy, Michigan 48084-7186

POC: John Wolf PH: 248-435-1519 FAX: 248-435-1208

Email: wolfjm@meritorauto.com

Axle Carrier/Differential Specifications:

Manufacturer:	Meritor Automotive Inc.
Type:	5000 Series
Ratio:	1.5:1
Feature:	Driver Controlled Differential Locks (DCDL)
Similar Applications:	Palletized Loading System (PLS) and Heavy Equipment Transporter System (HETS)

Benefits to LVSr Program:

Allows Interoperability with Baseline LVS and Raydan/HHP RBU Designs

Acknowledgements:

NATC/Island City would like to recognize the efforts of John Wolf and the personnel from Meritor Automotive Inc. in Troy, Michigan.

LVSR TECHNOLOGY DEMONSTRATOR LUBRICANT



LVSR Downselected Team Member
Exxon Mobil Lubricants and Petroleum
Specialties Company
8280 Willow Oaks Corporate Drive
Fairfax, VA 22031

POC: David Smith PH: 716-662-2009
FAX: 716-662-2009
Email: david_m_smith@email.mobil.com
Sam Hughes PH: 703-849-3781
FAX: 703-849-3401
Email: sam_j_hughes@email.mobil.com

ADI Technologies, Inc.
1487 Chain Bridge Road, Suite 204
McLean, VA 22101

POC: Chuck Cepak - PM
PH: 703-734-9626
FAX: 703-448-8591
Email: adit22101@aol.com

Lubricant Specifications:

Manufacturer:	Exxon Mobil
Product:	Mobil Delvac 1
Type:	Fully Synthetic Lubricant
SAE Grade:	5W-40
Gravity, API:	32.3
Pour Point:	-65° F
Flash Point, ASTM D 92,	446° F
Viscosity	
cSt at 40 C:	95
cSt at 100 C:	15.0
SUS at 100 F:	481
SUS at 210 F:	79
Cranking Viscosity, cP at -25 C:	3,200
Pumping Viscosity, cP at -35 C:	20,500
Borderline Pumping Temperature:	-47° F
HT/HTS, cP at 150 C:	4.1
Viscosity Index:	167
Sulfated Ash, wt %:	1.3
TBN, ASTM D 2896:	11
Color, ASTM D 1500:	5

LVSr TECHNOLOGY DEMONSTRATOR LUBRICANT (CONTINUED)

Advantages to LVSr Program:

- Extends Engine Life
- Unparalleled Extreme Temperature Performance
- Full Synthetic Provides Fuel Savings
- Extends Drain Intervals
- Provide Superior Soot Handling
- Reduces Oil Consumption
- Delivers Resistance To Thermal Degradation, Oxidation, Wear and Corrosion Under Most Demanding Circumstances
- Reduced Maintenance Frequency Results in Maximum Uptime Availability
- Provide Rapid Cold Engine Start -ups and Warm-ups
- Environmentally Friendly - Extended Service Life Minimizes Waste Oil Generation

Acknowledgements:

NATC/Island City would like to recognize the efforts of Jeff Zudock, Mark Velkoff and Sam Hughes of the Mobil Corporation in Fairfax, Virginia.

LVSR TECHNOLOGY DEMONSTRATOR

COMPUTERIZED - "GLASS DASH"



LVSR Downselected Team Member
Newest Computers, Incorporated
1880 Donald Street
Reno, Nevada 89502-5208
Website: www.newestcomputers.com



POC: Alfred J. Gangi (Mechanical Design) PH: 775-826-5656
FAX: 775-826-6620 Email: fred@newestcomputers.com
Alfred M. Gangi (Electronic Design) PH: 775-826-5656
FAX: 775-826-6620 Email: al@newestcomputers.com

"Glass Dash" Specifications:

NCI has designed and fabricated the Mechanical Enclosure, Internal Electronics and Electro-Mechanical Components, shown above and listed below:

Qty (2) - TFT Liquid Crystal High Brightness Screens

functionality: screen 1: displays simulated gauges @ intensities of 0 to 1500 Nits
screen 2: displays simulated gauges @ intensities of 0 to 1500 Nits

Qty (2) - AMD Elan CPU based Computers

functionality: Computer 1: interfaces with screen #1
Computer 2: interfaces with screen #2

Qty (2) - NCI power, heater and video controller

functionality: Provides the required regulation of vehicle's 24 volt battery power for:

- 5v computer power and 3.3v screen power
- Thermostatic control of the heater power
- Video interface and screen brightness control

Qty (2) - NCI 4-Button Screen Display Controller Panels

Button Functionality:

Display Controller

- Provides Multi-Function
- Displays are Controlled by Requirements

LVSR TECHNOLOGY DEMONSTRATOR

COMPUTERIZED “GLASS DASH” (CONTINUED)

LVSR “Light Control Panel”:

Qty (1) - NCI 24-Button “Light Control Panel”

Button Functionality:

B-1 Wipers	B-2 Wiper Speed	B-3 Wash
B-4 Blank	B-5 Dome Light	B-6 Map Light
B-7 Blank	B-8 Beacon Light	B-9 LHS Work
B-10 Night Vision	B-11 Park Lights	B-12 Driving Lights
B-13 LHS Marker	B-14 Panel Brightness	B-15 Run Lights
B-16 Black Out Drive	B-17 Panel Dim	B-18 Head Lights
B-19 Black Out Marker	B-20 Unlock	B-21 Service Drive
B-22 Blank	B-23 Off	B-24 Emergency Flash

LVSR “Transmission Selector Panel and Controller”:

Qtr (1) - NCI 25 - Button “Transmission Controller Panel”

Button Functionality:

LVSR-TRANS/CTI Selector Panel:

B-1 Paved Road	B-2 Full Load	B-3 Cross-Country
B-4 Multi-Terrain	B-5 Half Load	B-6 Off-Road
B-7 Deep Mud	B-8 Empty	B-9 Desert Sand
B-10 Spare	B-11 Spare	B-12 Spare
B-13 Jake #1	B-14 Jake #2	B-15 Jake #3
B-16 Trans Retard	B-17 Down Hill Assist	
B-18 R	B-19 1	
B-20 N	B-21 2	
B-22 D	B-23 3	
B-24 5	B-25 4	



LVSR “GPS/Maintenance Manuals Computer”:

Standard Flat Panel 12.1” Touch-Screen Compute

200 MHZ - Pentium Computer
 32 MB System RAM
 Resistive/Analog Touch Screen
 Wireless Infrared Keyboard
 Solid State HDD's
 Detachable Mounting Bracket



Acknowledgements:

NATC/Island City would like to recognize the efforts of Alfred J Gangi, Alfred M. Gangi and the personnel from Newest Computers Inc. in Reno, Nevada.

LVSr TECHNOLOGY DEMONSTRATOR

INTEGRAL BALLISTIC AND COLLISION PROTECTION



O'GARA-HESS & EISENHARDT

An Armor Holdings Company

LVSr Downselected Team Member
O'Gara-Hess & Eisenhardt (OHE)
9113 Le Saint Drive
Fairfield, Ohio 45014

POC: Karen Amaya PH: 513-881-5448 FAX: 513-874-2558
Email: kamaya@ogara-hess.com

Ballistic Protection Specifications:

Manufacturer:	O'Gara-Hess & Eisenhardt (OHE)
Crew Protection Kit:	
Protection Levels:	
Small Arms:	7.62 NATO Ball (M80) - Threshold 7.62 Armor Piercing Incendiary B32 - Objective
Glass & Floor Panels:	90% Probability of No Perforation at a 90% Confidence Level at 0 Degrees Obliquity at a 100 Meter Equivalent Velocity Threshold
Other Areas & Roof:	90% Probability of No Perforation at a 90% Confidence Level at 30 Degrees Obliquity at a 100 Meter Equivalent Velocity Threshold
Distance Between Shots:	120 mm. Equivalent Triangle
Must Stop:	90% of Artillery Fragments U.S. 155 mm HE Rounds, M107 (CompB) Fired at 100 Meters, At any Elevation or Azimuth with a 90% Confidence Level (20 mm FSP May Be Used) Threshold

LVSR TECHNOLOGY DEMONSTRATOR

INTEGRAL BALLISTIC AND COLLISION PROTECTION (CONTINUED)

As Equipped in LVSR:

- Integrated Skid Plate
- Armor Materials that are State of the Art, Proven, Producing and Cost Effective - Planned
- Ballistic Fragmentation Protection for the Cab - Planned

Advantages to LVSR Program:

- Provides Protection Against Ballistic Fragmentation
- Improved Crew Protection
- Improved Vehicle Protection
- Improved Collision Protection
- Frontal Impact Protection
- Oblique Protection

Acknowledgments:

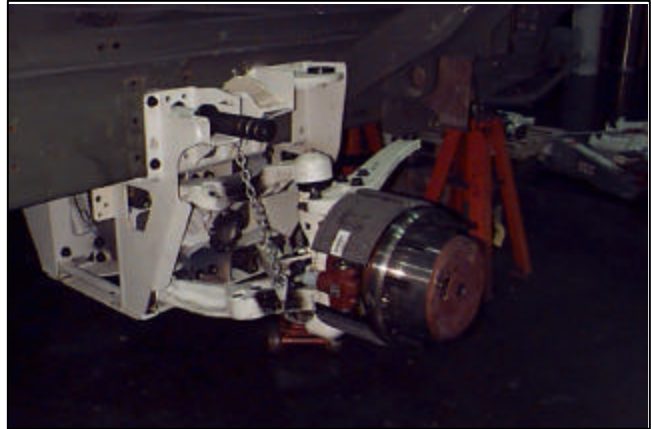
NATC/Island City would like to recognize the efforts of John Mayles, Karen Amaya and the personnel from O’Gara-Hess & Eisenhardt in Fairfield, Ohio.

LVSR TECHNOLOGY DEMONSTRATOR

SUSPENSION



LVSR Downselected Team Member
Oshkosh Truck Corporation
2307 Oregon Street
Oshkosh, Wisconsin 54903



POC: Donald Verhoff PH: 920-233-9352 FAX: 920-233-9264
Email: dverhoff@oshtruck.com
Norb Osburn PH: 920-233-9673 FAX: 920-233-9506
Email: nosburn@oshtruck.com

Suspension Specifications:

Manufacturer:	Oshkosh Truck Corporation
Model:	"Panther®"
Type:	Fully Independent with Upper and Lower Control Arms Integral Attachment to Differential Housing Single Coil Spring to Lower Control Arm Anti-Sway Bar on Axles #3, 4, and 5 Oshkosh "ALL STEER®" Wheel Positions #2, 4 and 5 Mechanically Linked #1 Axle
Steering:	15.5 / 14 inches
Wheel Travel (F / R):	17,000 / 26,000 lbs
Axle Rating (F / R):	690 / 1250 lbs/in (at one wheel)
Wheel Rate (F / R):	Hydraulic, 2.062 in. bore 22,000 lb tensile strength
Shock Absorber:	Hyrel (polyether-ester copolymer) 18,500 lb compressive strength 10,800 lb compressive strength
Suspension Stop:	
Jounce:	
Rebound:	

LVSR TECHNOLOGY DEMONSTRATOR SUSPENSION (CONTINUED)

As Equipped in LVSR:

- 60% Rebound Travel/40% Jounce Travel
- CTIS Compatible
- ABS Compatible
- Inter- and Intra-Axle full lock-up capability
- Double Reduction Axles
- 98" Vehicle Width
- E-coat with CARC Topcoat Spring Corrosion Protection
- Fixed Jounce and Rebound Limiters

Advantages to LVSR Program:

- 30% Side Slope capable
- Improved Ride Quality
- Lowers Vehicle CG
- Double-Reduction Axles Allow Increased Ground Clearance
- Meets 80 ft Diameter Turning Circle
- MTVR Part Commonality and Modular in Design
- Operable from -40 to 125 degrees F
- 1 Hz Suspension Natural Frequency

Acknowledgments:

NATC/Island City would like to recognize the efforts of Don Verhoff, Norb Osburn, Jesse Gander and the personnel from Oshkosh Truck Corporation in Oshkosh, Wisconsin.

LVSr TECHNOLOGY DEMONSTRATOR ACOUSTIC FOAM/FLOOR MATS



LVSr Downselected Team Member

Soundcoat Company

1 Burt Drive

Deer Park, NY 11729-5701

POC: Rick Ballard PH: 618-998-8096 FAX: 618-998-9167

Email: rballard@soundcoat.com

Acoustic Foam Specifications:

1" Soundfoam S with Black Matte and MDK

Floor Mat Specifications:

1 1/2# PB Lava with 1/2"CSD and MDK

Acknowledgements:

NATC/Island City would like to recognize the efforts of Rick Ballard and the personnel from Soundcoat in Deer Park, New York.

LVSR TECHNOLOGY DEMONSTRATOR

CENTRAL TIRE INFLATION SYSTEM



LVSR Downselected Team Member

Syegon-Giat Industries

13 Route de la Miniere

Versailles, Cedex, France 78034

POC: Mario Staffolani PH: 011-331-309-73549 FAX: 011-331-309-73687

Email: m.staffolani@giat-industries.fr

Alain Poirot PH: 011-331-309-73549 FAX: 011-331-309-73687

Email: A6R@wanadoo.fr

Central Tire Inflation System Specifications:

Manufacturer:

Syegon-Giat Industries

Type:

Settings:

Improved Road

Cross-Country

Multi-Terrain

Snow/Ice

Deep Mud

Desert Sand

Over-Speed:

Over-Speed Inflates Tires to

Appropriate Pressure

Integration:

CTIS Selector is Primary Operator

Mobility Control Interface to

Instruct Transmission on Current

Terrain and Load Conditions

Rapid Tire Deflation at Wheel:

Less Than 25 Seconds to Deflate

16R20 Tire from Improved Road

to Desert Sand Settings

Wheel Valve:

Air Inlet (Inflation):

4 mm Diameter

Air Outlet (Deflation):

6 mm Diameter

LVSR TECHNOLOGY DEMONSTRATOR CTIS (CONTINUED)

As Equipped in LVSR:

- Electronic Control Unit
- Pneumatic Control Unit
- Puncture Warning
- Anomaly Warning
- “Black Out” Mode
- Overspeed Warnings
- Potential Wheel Valves

Advantages to LVSR Program:

- Rapid Deflation Times
- Rapid Inflation Times
- Push Button Operator Controls
- 3 Functions Wheel Valve
 - Inflation
 - Deflation
 - Pressure Check

Acknowledgements:

NATC/Island City would like to recognize the efforts of Mario Staffolani, Alain Poirot, Robert Becuwe, David Dominy and the personnel from Syegon-Giat Industries and A6R in Versailles, France.

LVSR TECHNOLOGY DEMONSTRATOR WHEELS



LVSR Downselected Team Member

Titan International
2701 Spruce Street
Quincy, Illinois 62301

POC: Gary Hemming PH: 217-221-4400 FAX: 217-228-9331
Email: ghemming@titan-intl.com

Wheels Specifications:

Manufacturer:	Titan International
P/N:	05-13145-00
Type:	Bolt-Together
Size:	20 x 10.00
Compatibility:	14.00R20/16.00R20/395/85R20
SAE:	J1994

As Equipped in LVSR:

- Same Wheel as MTRV with Minor Modifications to Accept Syegon CTIS Components

Advantages to LVSR Program:

- Permit Use of CTIS
- Eliminate Use of Loose Components as Required on “Conventional Wheels”
- Easier Use of Beadlocks or Run Flat Devices
- Permits Field Change of Tires with Common Tires
- Increased Mobility When Used with Beadlocks and Reduced Inflation Pressure
- Commonality with MTRV

Acknowledgements:

NATC/Island City would like to recognize the efforts of Gary Hemming and the personnel from Titan International in Quincy, Illinois.

LVSR TECHNOLOGY DEMONSTRATOR TRANSMISSION



LVSR Downselected Team Member
Twin Disc, Incorporated
1328 Racine Street
Racine, Wisconsin 53405

POC: Ed Wilson PH: 817-652-0632 FAX: 817-633-5520
Email: eedprojects@worldnet.att.net
Craig Cox PH: 414-554-0640x3582 FAX: 414-554-2769
Email: CraigC@twindisc.com

Transmission Specifications:

Manufacturer:	Twin Disc Incorporated
Model:	TD61 - 1183
Type:	Automatic Transmission, 6-Speed
Weight:	1600 lbs.
Gear Ratios:	
1st Gear:	9.86:1
2nd Gear:	5.62:1
3rd Gear:	3.63:1
4th Gear:	2.45:1
5th Gear:	1.40:1
6th Gear:	.903:1
Reverse:	7.34:1

Torque Converter Specifications:

Manufacturer:	Twin Disc Incorporated
Model:	8FLW1854-1 Ms402
Type:	Single Stage, Rotating Housing, With Lockup
Weight:	740 lbs.
Stall Torque Ratio:	2.12

LVSr TECHNOLOGY DEMONSTRATOR TRANSMISSION (CONTINUED)

As Equipped in LVSr:

- P05 Integral, 184 Hp Hydrostatic Retarder
- Steering Pump Mounts to Torque Converter
- Secondary Steering Pump Mounts to Transmission
- Fan Drive Pump Mounts to Torque Converter
- Cooling System - Integrated Transmission Cooler
- Primary Steering Mounts to Torque Converter
- Multi-Purpose Main Hydraulic Pump
 - Fan Drive
 - Auxillary Hydraulics
 - Retarder
 - Oil-Heater (Rapid Warm-Up)
- GP4 Control System
- 70/30 Differential Split

Advantages to LVSr Program:

- Demonstrated Ability on 60% Longitudinal Slope
- Demonstrated Ability on 30% Side Slope
- SAE J1939 Controlled
- Self Diagnostic
- Full 1965 lb.ft. Torque Available
- Integrated with Single Oil Lubrication System
- Combat Override Mode and Limp-Home Ability
- No Preparation for Lift and Tow or Flat Tow
- Motor Oil as Lubricant
- Common Lubricant Reservoir - Single Fill Point

Acknowledgements:

NATC/Island City would like to recognize the efforts of Ed Wilson, Craig Cox, Mike Gee and the personnel from Twin Disc Incorporated in Racine, Wisconsin.